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December 15, 1986

Cerro Copper Products Company
P.O. Box 681
East St. Louis, Illinois 62202

Attention: Mr. Sandy A. Silverstein
Manager, Energy and Environmental Affairs

Gentlemen:

Subject: Cerro Copper Products
IEPA RI/FS Oversight
E&E Chain-of-Custody Procedures

In our November 12, 1986, daily report covering our oversight of Ecology and Environment (E&E) in their work on Cerro Property related to the IEPA Sauget Area RI/FS, we mentioned our concern about E&E's sample chain-of-custody procedures. Per your request, we are providing the following additional information regarding this concern.

Attachment A contains 13 pages from E&E's proposal to IEPA for the Sauget Area RI/FS, which we assume provides the procedural basis for E&E's activity on the project. A review of the highlighted information establishes that a formal chain-of-custody procedure is required for all samples, including split samples. The chain-of-custody record (see Page A-2 in attachment) is to be completed for split samples to document the sampling activity, analytical time constraints, and most importantly the transfer of custody.

It is our concern that if the formal established procedure is not followed for the split samples provided Cerro by way of Sverdrup Corporation personnel, the validity of any analytical results obtained by Cerro for the samples may not be considered valid in the eyes of the regulatory agencies or other jurisdictions that may become involved in future phases of the work.

I trust this information serves to explain the basis for our concern about the E&E procedures. Please contact me if you have questions.

Sincerely yours,

SVERDRUP CORPORATION

Larry J. Oliver

Larry J. Oliver
Project Manager

Attachment (13 pages)

C284-A

ATTACHMENT A

expenditures. These expenditures are increasing dramatically as remedial work begins at waste sites throughout the nation.

- As the litigation climate continues to develop, it is becoming increasingly more likely that E & E laboratory and field personnel will be required to testify as to how samples were gathered and how resultant data were developed.

- A number of states are developing rigorous certification requirements for laboratory analysis that must be met as a prerequisite to performing analytical work in their respective jurisdictions.

The need for establishing and adhering to the protocols specified in this manual is therefore of critical importance. The following sections of the manual detail the procedures that all E & E field and ASC personnel are expected to implement to achieve the overall goals and address the numerous concerns outlined above.

To ensure that analytical data are defensible, E & E laboratory and field procedures must be able to meet the following four criteria:

- The sample, as taken, must be representative of the wider body of material of which it is a part;

- The sample analyzed, and for which data are reported, must be the actual sample taken from the site in question;

- The sample must be analyzed within required holding times and stored properly to minimize degradation of the sample between the time of sample collection and the time of sample analysis (and beyond if samples are kept for possible further or repeated analysis) either through processes taking place within the sample (e.g., bacteriological modification of chemical species) or through tampering; and

- The data reported by the laboratory must be a fair indication of the conditions in the sample at the time of analysis and

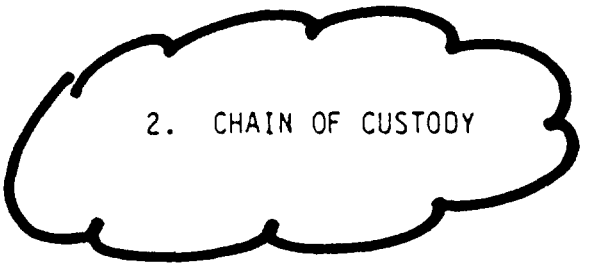
therefore (assuming the three preceding criteria are met) are representative of the conditions in the wider body of material at the time the sampling was conducted.

To meet these criteria, E & E must therefore ensure that all tecnnical procedures used (sampling, analysis) are as good as they can be, and that all manipulations involving the sample (sampling, transport, unpacking, storage, removal from storage, analysis, data reporting) are rigorously documented. Fortunately, most sampling, preservation, and analysis procedures are well established and have been approved by various agencies (such as EPA) so that they are known to give acceptable results if they are accurately followed. Nonetheless, both field sampling and laboratory analysis must follow a system of quality control checks (e.g., through use of field blanks, check standards) to provide supporting information on the quality of analytical data and the methods employed. This is what is generally known as quality control (QC). The processes of documenting all sample movements and ensuring that samples are not tampered with are together known as chain-of-custody procedures. The overview of certifying that both QC and chain-of-custody procedures have been properly used to support good technical methods of sampling and analysis in producing accurate data is quality assurance (QA). QA is generally a supervisory function.

This manual does not cover specific procedures for methods of sampling or analysis. This would be beyond the scope of this manual and for detailed information on these procedures the appropriate standard references must be consulted. The manual does address the following topics:

- Section 2 sets forth the protocols to be followed by ASC and field personnel to ensure unbroken chain of custody from sampling to analysis.

- Section 3 deals with sampling QC procedures including use of field blanks and duplicate samples.



2. CHAIN OF CUSTODY

2.1 FIELD PERSONNEL RESPONSIBILITIES

2.1.1 Definition of Sample Custody. A sample is in an individual's custody if: it is in his or her actual physical possession; or it is in view after being in physical possession; or it was in physical possession and then locked up or sealed to prevent tampering; or it is in a secured area.

2.1.2 Field Preparation. Before leaving for the field, all personnel involved in field sample collection will familiarize themselves with the procedures specified in this manual and with all unique sampling and chain-of-custody procedures to be employed during the specific field operations. The project manager, equipment manager, and site safety officer should be consulted as appropriate. All sample containers are obtained at the ASC and are to be properly cleaned and decontaminated. They will be chosen by the project manager in conjunction with the ASC manager, to accommodate specific types of samples. Procedures for cleaning sample bottles are contained in Appendix T.

2.1.3 Field Custody and Documentation. All field personnel must verify the sampling methods to be employed during sample collection by making proper reference to the project plans. Prior to sampling, the field sampling personnel must ensure that all sample containers are in his/her physical possession or in his/her view at all times, or ensure that the containers are stored in a locked place at all times, so as

to maintain proper custody. All sample gathering activities must be recorded in the site logbook; all sample transfers must be documented in the chain-of-custody record; all samples are to be identified with sample tags, labels, or other appropriate means of identification (hereinafter referred to as sample tags); and all sample bottles are to be sealed with custody seals. All information is to be recorded in waterproof ink. All E & E field personnel are personally responsible for sample collection and the care and custody of collected samples until the samples are transferred or properly dispatched.

2.1.3.1 Site Logbooks. Site logbook(s) must be maintained for each project. All site logbooks must be bound, contain numbered pages, and be waterproof. The following documentation is to be recorded in the site logbooks: sampling locations, station numbers, dates, times, sampler's name, designation of the sample as a grab or composite, notation of the type of sample (e.g., groundwater, soil boring, etc.), preservatives used, on-site measurement data, and other field observation information and remarks. Each series of site logbook entries for a particular sampling effort must be initialed by the person recording the information and, where appropriate, summary entries that organize and/or clarify data presented in the logbook are to be prepared by the person recording the information. After reviewing the entries, the field team leader must sign each page of the site logbook on the top and the bottom.

As with all data logbooks, no pages will be removed for any reason. If corrections are necessary, these must be made by drawing a single line through the original entry (in such a manner that the original entry can still be read) and writing the corrected entry alongside. The correction must be initialed and dated. Most corrected errors will require a footnote explaining the correction.

The site logbook is the prime repository of information of actual site conditions and as such is an important link in the analytical chain. Any details which may be relevant to the analysis or integrity of samples must be recorded. Preliminary sample descriptions are helpful. Any unusual circumstances should be noted, e.g., heavy rain, or

difficulty in pH meter calibration. At the completion of the sampling exercise, the logbook must be retained by and/or returned to the project manager and is to be made part of the permanent project file. To the extent that any information contained in the logbook is relevant to sample analysis to be performed, such data are to be made available to the laboratory performing said analyses by the project manager.

2.1.3.2 Chain-of-Custody Record. The custody record (see Appendix A) must be fully completed in duplicate, using black carbon paper where possible, by the field technician who has been designated by the project manager as being responsible for sample shipment to the appropriate laboratory for analysis. The information specified on the chain-of-custody record will contain the same level of detail found in the site logbook, with the exception that the on-site measurement data need not be recorded. The custody record will include, among other things, the following information: name of person collecting the samples; date samples were collected; type of sampling conducted (composite/grab); location of sampling station; number and type of containers used; and signature of the E & E person relinquishing samples to a non-E & E person, such as a Federal Express agent, with the date and time of transfer noted. In addition, if samples are known to require rapid turnaround in the laboratory because of project time constraints or analytical concerns (e.g., extraction time or sample retention period limitations, etc.) the person completing the chain-of-custody record should note these constraints in the remarks section of the custody record.

If it is is not practicable to seal all containers at a Federal Express office, they should be sealed beforehand. The duplicate custody record will therefore have the signature of the relinquishing field technician and a statement of intent such as "To Federal Express (Baltimore office) p.m. 6/31/84." The duplicate custody record is then placed in a plastic bag, taped to the underside of the box lid, and the box closed. The container is to be tightly bound with filament tape, and if required, at the discretion of the project manager, may be padlocked (see 2.1.7.2). Finally, at least two custody seals (2.1.3.4 below) are to be signed by the individual relinquishing

custody and affixed in such a way that the box cannot be opened without breaking them.

At the ~~shipping~~ agent's office, the relinquishing individual will put all the specific shipping data (airway bill number, office, time, and date) on the original custody record which is to be transmitted to the project manager (by mail or by hand as appropriate). The original and duplicate custody records and the airway bill or delivery note together constitute a complete record and it is the project manager's responsibility to ensure that all are consistent and they are made part of the permanent job file maintained at the ASC.

At the laboratory, the sample custodian (hereinafter, custodian) will open the package, retrieve the duplicate record, and complete the "Received for Laboratory by" box by affixing his signature. The custodian also is to fill in the "Method of Shipment" box with the shipper's name (e.g., Federal Express) and airway bill number. Custodian responsibilities are more fully covered in Section 2.2 below.

2.1.3.3 Sample Tags. E & E field personnel must properly identify all samples taken in the field by using a sample tag attached to or affixed around the sample container. The type of sample tags used must be E & E standard. It is the responsibility of the field team leader to obtain a sufficient quantity of sample tags before leaving for the site. The sample tag must contain the field identification number; the date, time, and location of sample collection; designation of the sample as a grab or composite; notation of the type of sample (e.g., groundwater, soil boring, etc.); identification of preservatives used; any remarks; and the signature of the sampler. The sample tags are to be placed on the bottles so as not to obscure any QA/QC data on the bottles; sample information must be printed in a legible manner using waterproof ink. Field identification must be sufficient to enable cross-reference with the site logbook.

2.1.3.4 Custody Seals. Custody seals are preprinted adhesive-backed seals with security slots designed to break if they are disturbed. Individual sample bottles are sealed over the cap by the sampling technician. Sample shipping containers (coolers, cardboard boxes,

etc., as appropriate) are sealed in as many places as necessary to ensure security. Seals are signed and dated before use. On receipt at the laboratory, the custodian will check (and certify, by completing logbook entries) that seals on boxes and bottles are intact.

2.1.4 QC Samples. For chain of custody purposes, all QC samples are subject to exactly the same custodial procedures and documentation as "real" samples. Usually QC samples are clearly labelled as such. However, in some cases when the project manager wishes to ascertain laboratory performance on blind samples, he/she may decide to put misleading source information on the QC samples, such as a non-existent well or stream. Especially rigorous documentation of such information in the site logbook is essential. Additional information on QC sample protocols, as well as the nature and use of QA samples (including duplicates, blanks, and split samples), is provided in Section 3.

2.1.5 Field Sampling - General Criteria. This manual is not intended to address specific sampling or analytical methods. However, the general rules for field staff provided below are to be adhered to. Sampling methods are chosen and used under the following constraints:

- The method must be approved by the appropriate government agency (federal, state, or local);
- The method must maintain the integrity of the sample so that the analytes of interest are neither increased (i.e., contaminated) or decreased (e.g., through volatilization);
- The sample as preserved and bottled must be safely handled in transit; and
- The sample itself must be representative of the larger body of material.

The sampling technique to be used in any situation will be chosen by the project manager, who may include other criteria in the choice,

such as cost, availability of equipment, and available experienced personnel.

Sample custody begins at the time of sampling. Site logbooks, chain-of-custody records, sample tags, and custody seals must all be completed in accordance with procedures outlined above.

The sampler must take precautions against cross contamination when using one sampling apparatus for a series of samples. If possible, known "clean" or "background" samples should be taken first. Upstream samples should be taken before downstream. Sample areas known or suspected to be heavily contaminated should be sampled last of all. Between each sample the apparatus should be cleaned or rinsed as specified in the sampling method. The sample plan may require that aliquots of the rinsing solution be kept for analysis: this, and the use of field blanks and duplicates, is more fully covered in Section 3.3. Samples may require filtering (see Section 3.5). Preservation techniques for various analytes are listed in Appendix N. Sample bottles (types and quantities) are listed in Appendices B through E.

2.1.6 Sample Packaging. Samples must be packaged carefully to avoid breakage or contamination and must be shipped to the laboratory at proper temperatures. The following sample packaging requirements must be followed.

2.1.6.1 Sample bottle lids are never to be mixed. All sample lids must stay with the original containers. Custody seals must be affixed.

2.1.6.2 The sample volume level can be marked by placing the top of the label at the appropriate sample height, or with grease pencil. This procedure will help the laboratory to determine if any leakage occurred during shipment. The label should not cover any bottle preparation QA/QC marks.

2.1.6.3 Solid and liquid samples that are identified as high hazard (defined as anything obtained from a closed container or from a fresh

spill, or that is obviously undiluted or that contains constituent materials at concentration levels above 150,000 parts per million [ppm]) and medium hazard (defined as containing constituent materials at concentration levels between 10 and 150,000 ppm, or direct but diluted contamination, or material from previous spills, or discolored solid matrices, or turbid liquids) must first be sealed with a custody seal and then enclosed in a plastic bag. The sealed sample containers are then placed in paint cans containing sufficient vermiculite or zonolite inert materials to cushion the sample containers and absorb spills. The paint cans are sealed, properly labelled, and placed in the cooler in accordance with the requirements specified in the following subsections.

Note: The ASC does not knowingly accept samples with high levels of radioactivity or dioxins, or any samples for which the ASC's handling procedures may be insufficient to protect laboratory employees. Project staff and field staff must take all feasible precautions, including discussions with site officials and company representatives, and site observations to ensure that they, and ASC personnel, are not exposed to unduly hazardous materials. Note that field staff are (in many cases) equipped with personal protection and breathing apparatus not available to ASC personnel.

2.1.6.4 Unless specified otherwise in this manual, and to conform with good field practice techniques, all sample bottles must be secured with a custody seal and placed in a plastic bag to minimize the potential for vermiculite contamination.

2.1.6.5 Shipping coolers must be filled initially with approximately three inches of vermiculite or zonolite.

2.1.6.6 The secured sample bottles must be placed in the cooler in such a way as to ensure that they do not touch one another. Use additional levels of container protection (e.g., paint cans) if necessary.

2.1.6.7 Only low hazard samples (i.e., defined as environmental or less than 10 ppm of any single constituent) are to be cooled. "Blue ice" or some other artificial icing material is preferred. If unavoidable, ice may be used provided that it is placed in 3-mil plastic bags. Ice is not to be used as a substitute for packing material.

2.1.6.8 Any remaining space in the cooler should be filled in with inert packing material. Under no circumstances will locally obtained material (sawdust, sand, etc.) be used.

2.1.6.9 The duplicate custody record must be placed in a plastic bag and taped to the bottom of the cooler lid.

Note: Appendices B through H illustrate various aspects of sample collection, packaging, and shipment. All field personnel are expected to read and understand the instructions contained in these appendices.

2.1.7 Shipping Containers/Packages. Environmental and hazardous samples will be properly packaged and labelled for shipment and dispatched to the appropriate laboratory for analysis. A separate chain-of-custody record must be prepared for each laboratory. The following requirements for shipping containers must be followed.

2.1.7.1 United States Department of Transportation (DOT) regulations covering the transport of hazardous materials are contained in 49 Code of Federal Regulations (CFR) Parts 170-179. E & E field personnel should acquaint themselves with the general provisions of these regulations.

2.1.7.2 Shipping containers are to be padlocked or custody-sealed for shipment, as appropriate. The package custody seal is to consist of filament tape wrapped around the package at least twice and a custody seal affixed at appropriate access points. In this way, access to the package can be gained only by cutting the filament tape and breaking the seal.

2.1.7.3 All of the shipping coolers/package containers must be secured by field personnel with a proper custody seal, marked with indelible pen or ink, and addressed to Ecology and Environment, Inc., Analytical Services Center, 4285 Genesee Street, Buffalo, NY 14225, or another laboratory as appropriate.

2.1.7.4 Field personnel will make arrangements for transportation of samples to the ASC. When custody is relinquished to a shipper, E & E field personnel will telephone the ASC custodian (716/631-0360) to inform him/her of the expected time of arrival of the sample shipment and to advise him/her of any existing time constraints on sample analysis. The ASC must be notified as early in the week as possible, and in no case later than 3:00 p.m. (eastern time zone) on Thursday, regarding samples intended for Saturday delivery.

Note: See Appendices F, G, and H for a summary of packaging and shipment procedures.

2.1.8 Verification of Compliance. Before leaving the field, field personnel must verify compliance with the previously discussed E & E chain-of-custody and documentation procedures. Upon return from the field, all site logbooks, site maps, and original chain-of-custody records must be returned to the project manager. Field personnel may retain photocopies of non-confidential materials for their personal files. As stated previously, original chain-of-custody records are to be forwarded to the ASC by the project manager for inclusion in the permanent file maintained at the ASC.

3.4 SPLIT SAMPLES

Occasionally, a client or government agency requires that samples be split: ~~one~~ portion to be retained by the client/agency or analyzed by another laboratory, and one sample for E & E analysis. E & E field personnel are to cooperate and accommodate that request, provided that appropriate containers are available. Identical sample tags will be attached to the two (or more) containers. The E & E sample will be clearly marked as such and treated in accordance with normal procedures. Any other split samples will remain subject to chain-of-custody procedures until they are relinquished to the person requesting them. E & E personnel also may be required to comply with the custodial procedures preferred by the person requesting the split samples; these procedures will be complied with on a case-by-case basis. All split samples will be documented in the site logbook.

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CHAIN-OF-CUSTODY RECORD

Project No.	Project Name

Samplers: (Signature)

STA. NO.	DATE.	TIME	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE TYPE AIR	STATION LOCATION	NO. OF CON-TAINERS	REMARKS

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	
				Method of Shipment	

Coordinator Field Files

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